A METHOD AND APPARATUS FOR LOAD-BASED BILLING IN COMMUNICATION NETWORKS

BACKGROUND OF THE INVENTION

[0001] The present invention relates generally to the art of telecommunications, and, more particularly, to a method and apparatus for load-based billing in communication networks.

[0002] By way of background, communication network usage is typically driven by subscriber demand. This applies to many types of communication networks, including wireless networks (CDMA, GSM, UMTS), wireline networks (PSTN, PLMN), and 3GPP/3GPP2 multimedia networks. Communication networks are often "over-engineered" in order to support high usage scenarios (*e.g.*, Mother's Day). Currently, however, there is no way for the service provider to stimulate demand in real time during the times when the network is underutilized. Conversely, in times of crisis (*e.g.*, natural disasters) service providers may want to discourage non-essential calling. Currently, there is no mechanism for treating such situations.

[0003] Thus, there is a need in the art for a method and apparatus for load-based billing in communication networks, wherein underutilization and/or overutilization of a network can be detected and analyzed by a network element in real-time and customers can be provided with a stimulus to better optimize traffic levels on the network.

SUMMARY OF THE INVENTION

[0004] A method and apparatus for load-based billing of customers in a network are provided.

[0005] In one aspect of the invention, a method of load-based billing for customers in a communication network is provided. The method comprises monitoring utilization of the network in real-time via a switching center in the network; detecting at the switching center a reportable statistical event based upon the occurrence of a predetermined event trigger; informing a usage level application of the reportable statistical event; and determining at the usage level application whether a Usage Level Event has occurred. When it is determined that a Usage Level Event has occurred, the usage level application records the Usage Level Event, reports the Usage Level Event to a set of network elements via the usage level application and the switching center, where the set of network elements includes a customer billing platform and a broadcast message application. Further, a set of customers is notified of a change in pricing for calls based upon the Usage Level Event through the broadcast message application and a messaging center.

[0006] In another aspect of the invention, an apparatus for load-based billing of customers in a communication network is provided. The apparatus comprises means for monitoring utilization of the network in real-time via a switching center in the network; means for detecting at the switching center a reportable statistical event based upon the occurrence of a predetermined event trigger; means for informing a usage level application of the reportable statistical event; and means for determining

at the usage level application whether a Usage Level Event has occurred. The apparatus further comprises (1) means for recording the Usage Level Event, (2) means for reporting the Usage Level Event to a set of network elements via the usage level application and the switching center and (3) means for notifying the customers of a change in pricing for calls based upon the Usage Level Event through the broadcast message application and a messaging center, when it is determined that a Usage Level Event has occurred. The set of network elements includes a billing platform and a broadcast message application.

[0007] In accordance with yet another aspect of the present invention, an apparatus for load-based billing of subscribers in a communication network is provided. The apparatus includes a plurality of communication devices operative to receive and transmit at least one of voice, text, multimedia and data communication; a switching center operative to route calls to and from the communication devices in the network and monitor the utilization of the network; a subscriber database operative to store subscriber profile information and mobility management information; a messaging center operative to direct messages to and receive messages from the communication devices; a billing platform operative to receive call detail records from the switching center; a usage level application operative to analyze load usage in the network and determine whether a Usage Level Event has occurred; and a broadcast message application containing a set of predetermined messages relating to Usage Level Events.

[0008] Further scope of the applicability of the present invention will become apparent from the detailed description provided below. It should

be understood, however, that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art.

DESCRIPTION OF THE DRAWINGS

[0009] The present invention exists in the construction, arrangement, and combination of the various parts of the device, and steps of the method, whereby the objects contemplated are attained as hereinafter more fully set forth, specifically pointed out in the claims, and illustrated in the accompanying drawings.

[0010] FIG. **1** is a functional block diagram of a communication network suitable for implementing aspects of the present invention.

[0011] FIG. **2** is a flow chart illustrating a load-based billing method in accordance with the present invention.

[0012] FIG. **3** is a functional block diagram of a conventional wireless communication network suitable for implementing aspects of the present invention.

[0013] FIG. **4** is a call flow diagram of an implementation of the load-based billing method in a wireless network.

[0014] FIG. **5** is a call flow diagram illustrating a further example of the load-based billing method in the wireless network.

[0015] FIG. **6** is a call flow diagram illustrating an implementation of a targeted message method in a wireless network.

[0016] FIG. **7** is a call flow diagram illustrating an alternative implementation of the load-based billing method in a wireless network, based upon input from an external network.

[0017] FIG. **8** is a functional block diagram of a multimedia wireless network suitable for implementing aspects of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] It is to be understood that the specific method and apparatus illustrated in the attached drawings and described in the following specification are simply embodiments of the inventive concepts defined in the appended claims. Therefore, specific examples and characteristics related to the embodiments disclosed herein are not to be considered as limiting, unless the claims expressly state otherwise.

[0019] Referring now to FIG. **1**, there is shown a functional block diagram of a basic communication network **10** suitable for implementing aspects of the present invention. The network **10** may be wireless (CDMA, GSM, UMTS), wireline (PSTN, PLMN) or 3GPP/3GPP2 multimedia, for example. At least one communication device **12** is shown as being in communication with the network **10**. The communication device **12** may be of any type for voice, text, multimedia, and/or data communication, including mobile telephones, networked personal computers, handheld computing or digital devices, legacy landline devices, or any other such device.

[0020] Each communication device **12** communicates with a switching center **14** that directs communications between the communication devices **12** and various communication channels in the

network **10**. The main function of the switching center **14** is to route calls and perform call handling functions. The switching center **14** generally routes calls by accessing information in a subscriber database **16**. The network **10** may include multiple switching centers **14** that are collocated or spaced geographically apart.

[0021] The subscriber database **16** typically contains subscriber/customer profile information, and it may also contain mobility management information, in the case of wireless networks. The subscriber database **16** may maintain at least two types of subscriber information: subscription information and location information. Subscription information refers to the services that each subscriber is authorized to use under the subscriber's calling plan. The subscriber database **16** uses the subscription information to verify that the subscriber is authorized for certain types of services. Location information is used to properly route and bill the call.

[0022] The network **10** also includes a messaging center **18** that is in networked communication with the switching center **14**. The messaging center **18** receives messages of all types from and directs messages of all types to communication devices. The switching center **14** and the messaging center **18** may be located together or may be remote from each other, as is known in the art. The messaging center **18** may include a database (not shown) for storing messages and subscriber information.

[0023] The network **10** further includes a billing platform **20**, which receives call detail records from the switching center **14**. The billing platform **20** typically stores information concerning each subscriber's calling plan. A call detail record (CDR) is written by the switching center

14 whenever a call is originated or terminated through the switching center **14**. A CDR typically includes data such as the subscriber ID, the digits dialed, and the duration of the call.

[0024] The elements of the network **10** described thus far are standard in the industry, and their operation is well known in the art. The present invention comprises an improvement to the communication network **10** of the type shown in the drawings. The improvement includes adding a usage level application (ULA) **22** to analyze load usage in the network **10** based on current measurements from the switching center **14**. The ULA **22** is essentially an application server running on a platform. Protocols to the ULA **22** include, but are not limited to, SIP, AIN, or IS-771. The improvement also includes adding a broadcast message application (BMA) **24**, which may be integrated into the ULA **22** or into some other network element, such as the messaging center **18**. The BMA **24** contains predetermined messages relating to various Usage Level Events. In accordance with the present invention, the CDR may also contain a record of a special Usage Level Event that applies at the time the CDR is written.

[0025] It will be appreciated that certain components of the network **10**, such as the switching center **14**, the subscriber database **16**, the messaging center **18**, the billing platform **20**, the ULA **22**, and the BMA **24** may each be implemented with one or more specialized or general purpose computer systems. Such systems commonly include a high speed processing unit (CPU) in conjunction with a memory system (with volatile and/or non-volatile memory), an input device, and an output device, all as known in the art.

[0026] FIG. **2** is a flow chart **100** illustrating a basic load-based billing method that may be implemented in the network **10** in accordance with an aspect of the present invention. Initially, the switching center **14** monitors network utilization in real-time (step **102**). As system utilization is monitored, the switching center **14** detects a reportable usage statistic as determined by predefined event triggers (step **104**). The switching center provides certain statistics of utilization levels to the ULA **22** (step **106**), Next, the ULA **22** determines whether a Usage Level Event has occurred, based upon one or more predefined event triggers (step **108**). Triggers may include any one of the following: (1) a lower/upper level threshold, (2) trending thresholds, and (3) duration thresholds, or (4) some combination of these thresholds.

[0027] If the ULA **22** determines that a Usage Level Event has not occurred, then the ULA **22** takes no further action and waits for additional reportable statistics (step **110**). Otherwise, the ULA **22** informs other elements in the network **10**, such as the message service **18** and the billing platform **20** that a Usage Level Event has occurred and the scope of the Usage Level Event (step **112**). The network **10**, through the BMA **24** and the messaging center **18**, informs the subscribers (or end users) of a change in call pricing based upon the Usage Level Event (step **114**).

[0028] It is to be appreciated that the load-based billing method described above may be implemented in a variety of communication networks, including a conventional wireless network (*e.g.*, GSM, CDMA). FIG. **3** shows a functional block diagram of a conventional wireless network **200** to illustrate an example of an operating environment for the present invention. As shown in FIG. **3**, at least one mobile station **202** for

voice, text, and/or data communication is in wireless communication with the network **200**.

[0029] The network **200** may support a messaging service, such as short text messaging, whereby short text messages may be transmitted and/or received by the mobile station **202**. As an example, the short text message service could include or conform to the SMS standard that is part of the GSM Phase 1 standard, or any other wireless communication SMS standard, such as IS-41/IS-637.

[0030] Voice, text, multimedia, and/or data communications are conveyed to the mobile stations **202** via the network **200**. The network **200** includes any number of wireless transceiver stations **204** that correspond to a communication cell **206**, and the network **200** may include one or more cells **206**. The mobile station **202** within the cell **206** communicates with the network **200** via a wireless link with the appropriate transceiver station **204** as known in the art. The transceiver station **204** communicates with a mobile switching center (MSC) **208** that directs communications between the mobile station **202** and various communication channels.

[0031] The MSC **208** is a switch that generally routes calls and performs call and mobility handling functions. The network **200** may include multiple MSCs that are collocated or spaced geographically apart. The MSC **208** generally routes calls by accessing information in a home location register (HLR) **210**.

[0032] The HLR **210** is a functional database containing subscriber profile and mobility management information. The HLR **210** maintains subscription and location information. The HLR **210** uses the subscription

information to verify that the subscriber is authorized for prepaid wireless service, for example. One type of location information is the last MSC **208** that was registered as serving the subscriber. This is stored in the form of a mobile switching center identification number, which identifies the appropriate MSC. Other location information is used to calculate the cost of the call. In addition, the subscriber is identified using a mobile station identification number. Location information is used to properly route and bill the call.

[0033] The network **200** includes at least one short message service center (SMSC) **212** that is in networked communication with the MSC **208**. As defined in IS-637, the Short Message Service (SMS) allows the exchange of short messages between the mobile station **202** and the wireless network **200**, and between the wireless network **200** and an external device capable of transmitting and optionally receiving short messages. The external device may be a voice telephone, a data terminal or a short message entry system.

[0034] The SMS consists of message entry features, administration features, and message transmission capabilities. These features are distributed between the wireless network **200** and the SMSC **212** that together make up the SMS system. The SMSC **212** may be either separate from or physically integrated into the wireless network **200**. Short message entry features are provided through interfaces to the message center and the mobile station **202**. Senders use these interfaces to enter short messages, intended destination addresses, and various delivery options.

[0035] SMSC interfaces may include features such as audio response prompts and DTMF reception for dial-in access from voice telephones, as well as appropriate menus and message entry protocols for dial-in or dedicated data terminal access. Mobile station interfaces may include keyboard and display features to support message entry. Additionally, a wireless voice service subscriber can use normal voice or data features of the mobile station to call an SMS system to enter a message.

[0036] The SMSC **212** is also defined in IS-41/IS-637 and GSM MAP. The MSC **208** and the SMSC **212** may be located together or may be remote from each other, as is known in the art. The SMSC **212** may include a database (not shown) for storing messages.

[0037] The network **200** also includes a billing platform **214**. It is well known that wireless service providers will typically lock each of their customers into a particular calling plan, featuring a fixed monthly rate that buys them a certain number of airtime minutes and other extra features that may be added on. Such calling plan information may be stored in the billing platform **214**. The billing platform **214** continuously receives call detail records from the MSC **208**. In accordance with present invention, the CDR may include a record that a Usage Level Event applies at the time the CDR was written.

[0038] A service provider may also offer prepaid wireless as an alternative to long-term contracts. Like prepaid phone cards, these plans let customers buy a block of airtime that they can draw from until it runs out. In this regard, the network **200** may also include a prepaid platform

216 in networked communication with the MSC **208** for providing prepaid wireless services to subscribers.

[0039] When the prepaid subscriber enters calling information (*i.e.*, dials a telephone number) via the mobile station **202**, the mobile station **202** signals to the MSC **208**. The MSC **208** communicates with the prepaid platform to determine whether this call should be allowed for this subscriber at this time. Communication and control may occur via various protocols, including ISUP or TCAP. The format of both messages complies with the ANSI SS7 ISUP industry standard.

[0040] The prepaid platform **216** determines whether the subscriber has sufficient funds in his or her account to connect the call. The prepaid platform **216** is made up of several components that have switching, audio, prepaid information processing, and billing capabilities (not shown). The prepaid platform **216** determines whether to allow the call based on the funds in the subscriber's account and collects and processes the information needed to bill the call. The prepaid platform **216** supports a variety of different interfaces, including, but not limited to, CAMEL, IS-826, IS-771 or ISUP messaging.

[0041] The ULA **218** analyzes load usage in the network **200**, while the BMA **220**, which is in networked communication with the ULA **218**, maintains predetermined messages for the various Usage Level Events.

[0042] It is to be appreciated that the MSC **208**, the HLR **210**, the SMSC **212**, the billing platform **214**, the prepaid platform **216**, the ULA **218**, and the BMA **220** may each be implemented with one or more specialized or general purpose computer systems.

[0043] FIG. **4** is a call flow diagram **300** depicting an implementation of the load-based billing method in the wireless network **200**, whereby a Usage Level Event is detected and notice of the new calling rate is sent to the appropriate subscribers. The method may be implemented through software that is distributed throughout the network **200** as described below.

[0044] Referring now to FIG. **4**, the MSC **208** detects a "Usage Level Event" (step **302**). A Usage Level Event may be detected in the following manner. It is well known to those skilled in the art that the MSC **208** typically monitors network occupancy and utilization, including processor occupancy, memory usage, trunk utilization, cell/RF utilization, voice coder utilization, and signaling link occupancy, among other things. The MSC **208** may collect data concerning such items as radio network occupancy (how hard the processor controlling the cells is working), trunk occupancy (how many trunks are busy or idle), call processing occupancy (how much time the CPU controlling call processing is working versus idle), and signaling occupancy (how hard the processor controlling the sending and receiving of signaling messages is working) in real-time throughout the day.

[0045] The MSC **208** will report measurements obtained in regard to system occupancy and utilization to the ULA **218** (step **304**). The MSC **208** may use some threshold values to determine which statistics to send to the ULA **218**, or it may send all statistics to the ULA **218**. The ULA **218** will then apply threshold values and trending analysis, to determine if a Usage Level Event has occurred. The determination may be based on (1)

upper/lower thresholds, (2) trending thresholds, (3) duration thresholds or (4) a combination of these thresholds.

[0046] In accordance with the present invention, the ULA **218** determines the Usage Level Event (*e.g.* "low level 1") and the resources impacted (*e.g.,* specific cells **206** or the entire area covered by the MSC **208**) (step **306**). The ULA logic could be based on low or high usage threshold, a trend in usage threshold (*e.g.*, moving toward low usage over past 100 minutes), or a duration threshold (*e.g.*, reaching a low usage threshold for over 10 minutes), or some combination of these..

[0047] The ULA **218** records the Usage Level Event and also performs logic to determine what action, if any, needs to occur. The ULA **218** employs a program to determine the appropriate action(s), based upon inputs from multiple MSCs or based upon repeated triggers from the same MSC. Additionally, the ULA **218** will determine the "scope" of the Usage Level Event. For example, the ULA **218** could determine that the scope of the Usage Level Event applies to all calls to the 312 area code, to 312-xxx office code, or to a set of cells on a single MSC.

[0048] Once it is determined that action is required, the ULA **218** will inform the prepaid platform **216** that a high/low Usage Level Event is in effect and the scope of the event (step **308**). The prepaid platform **216** has billing rates associated with the Usage Level Event and would apply these to the applicable calls. Further, the ULA **218** will inform the BMA **220** that a Usage Level Event has occurred as well as the scope of the event (step **310**). The BMA **220** then sends a broadcast short message request to the SMSC **212** (step **312**).

[0049] As known to those skilled in the art, when the MSC **208** receives input that a point-to-point message is to be sent to a user, the SMSC **212** sends an SMS request to the HLR **210** for the location and availability of the mobile station **202**. For example, if the HLR **210** replies "user is available, serving MSC=xyz," then the SMSC sends a message to the MSC **208** for delivery to the mobile station **202**. If the HLR **210** says "user is not available," the message is saved at the SMSC **212** and the HLR **210** sets a flag in the subrecord for "messages pending." When the user registers later, the MSC **208** or the HLR **210** will send "user now available" indication to the SMSC **212**, and the SMSC **212** will deliver a message to the MSC **208** for delivery to the end user. If the event expires before "user now available," the SMSC **212** will not send the message, as illustrated in FIG. **5**.

[0050] Returning now to FIG. **4**, in step **314**, the ULA **218** informs the MSC **208** that a Usage Level Event is active as well as the scope of the event. For all calls originated/terminated within the scope, the MSC **208** will mark the CDR with an indicator that the calls occurred during the Usage Level Event. The "scope" will have location information (*e.g.* the appropriate MSC and/or cell). The location information that defines scope could be the MSC **208**, a list of cells **206**, a combination of these or something like "anywhere." The SMSC **212** sends short messages to the appropriate MSC **208** (step **316**).

[0051] In parallel to the above steps, as calls are originated and terminated at the MSC **208**, the MSC **208** will transfer CDRs to the billing platform **214**, which will then assign the billing rates to calls (step **318**).

Calls marked with a special Usage Level Event will be billed at the appropriate special rate.

[0052] The order of the steps in this process may be important in some situations. For example, it may be important for a subscriber to know about the high/low price event before their billing entity (the billing platform **214** or the prepaid platform **216**) begins to record the new pricing. In other words, a customer may want to know before making calls if the billing rate is going up. Therefore, steps **308** and **314** may need to happen after steps **310**, **312** and **316**.

[0053] FIG. **5** is a call flow diagram **350** illustrating an additional embodiment of the present invention, whereby the wireless network **200** may be notified that a Usage Level Event has ended. Initially, the ULA **218** determines that the Usage Level Event in effect should end (step **352**). This could be based on any one of the following: (1) a time interval provisioned at the ULA **218**, (2) trigger information from the MSC **208**, or (3) the lack of any trigger information from the MSC **208**. Next, the ULA **218** informs the prepaid platform **216** that the event has ended (step **354**). The ULA **218** then informs the SMSC **212** that the event has ended (step **356**). The SMSC **212** may have pending SMS requests that it would need to cancel (step **358**). The ULA **218** informs the MSC **208** that the event has ended (step **360**). The ULA **218** notifies the BMA **220** of the end of the event (step **362**). The BMA **220** sends a message to the SMSC **212** regarding the message to be sent and the scope (step **364**). The SMSC **212** sends an SMS message (or messages) to the MSC **208** indicating that the special rates have ended.

[0054] FIG. **6** represents a call flow diagram **400** for an alternative embodiment of the present invention whereby targeted messages are sent to specific users in a wireless network. In this scenario, it is assumed that (a) a switching center, such as an MSC **402**, has detected a Usage Level Event in the manner described in connection with FIG. **4**, (b) the MSC **402** has informed a ULA **404** of the Usage Level Event, and (c) the ULA **404** has recorded the Usage Level Event and determined the next course of action. At this point, the ULA **402** sends a message **406** to a targeted marketing application (TMA) **408**, indicating the event and the universe. The main function of the TMA **408** is to apply the appropriate messages, based upon the individual calling plans for the subscribers.

[0055] Thus, the TMA **408** sends a request **410** to a database **412** for information regarding which calling plans are impacted by certain Usage Level Events and the new billing rates. The database **412** stores information **414** concerning the appropriate message for each service plan. Next, the TMA **408** sends a query **416** to a location (or presence) application **418** for information **420** concerning which subscribers are active in the "scope of the event" and for plans "impacted by the current event."

[0056] The functions and overall operation of the presence application **418** are known to those skilled in the art. For example, the presence application **418** may be used to determine where a particular mobile station is located, with location-based technology currently available. The presence application **418** would query some mobile infrastructure (not shown) to find the physical location of the relevant users with the right service plans. The infrastructure may include an element

such as a mobile positioning center, which would query the MSC **402** and/or an HLR **422** to find out where a particular mobile station is located. If the mobile station is currently engaged in a call, then the MSC **402** could reply with the current serving cell. If the users are idle, then the MSC **402** could send a page to the mobile station, which would respond and thereby establish its location.

[0057] The presence application **418** may also be used to determine whether the user is there and available or not, and is especially relevant to a data network such as one that America Online (AOL) might have. For example, the entry for a caller in the AOL network may be Bob@aol.com, where with the IP address replaces the cell information. It is to be understood that the present invention does not require phone numbers and a "telephony" sort of context. It could just as easily all apply to a data network model, such as one America Online (AOL) might use. Instead of an MSC that is writing billing records, it would be data network infrastructure. The AOL users would have service plans, and their location might not change when they are active. It is their presence that is relevant– *i.e.*, are they there or not? This concept is similar to Instant Messaging and Buddy Lists.

[0058] Returning now to FIG. **6**, the TMA **408** sends a request **424** for a specific short message for the appropriate users to a SMSC **426**. The SMSC **426** accesses the HLR **422** to determine the user location **428** (MSC and cell). Once the SMSC **426** has the user location information, it must verify that the MSC/cell is within the "scope" **430**. It should be noted that mobile users are often on the move. It is possible that the user has changed location during steps **424** and **428**. Thus, if the user has not

changed location, the SMSC **426** will send a short message **432** to the correct MSC **402**.

[0059] The general process by which the SMSC **426** sends a message is known to those skilled in the art. For example, the SMSC **426** may send an ANSI-41 SMSDeliveryPointToPoint (SMDPP) INVOKE to the serving MSC **402**. For the SMS broadcast application, the SMDPP will include, for example, bearer data and the "location" ID for this event. However, in accordance with the present invention, at least one new parameter will need to be added to this message – *i.e.*, a "user list." This user list could be any identifier to group users/customers (*e.g.,* the user class, the unique user ID, etc.) This parameter is supported by the HLR **422**, the MSC **402**, the TMA **408**, and the SMSC **426**.

[0060] FIG. **7** represents a call flow diagram **500** for an alternative embodiment of the present invention in which one network, such as a wireless network, responds to high usage in another network, such as the PSTN **502**. Thus, initially, a toll office in the PSTN **502** detects high usage in the usual manner. The high usage could be due to a natural disaster, such as a hurricane. The toll office in the PSTN **502** sends a message to a ULA (not shown) in the PSTN **502** to indicate high toll network utilization. The ULA in the PSTN **502** would, in turn, send a message **504** to a ULA **506** in the wireless network.

[0061] Based upon pre-determined criteria, the ULA **506** decides to inform **508** the BMA **510** that a Usage Level Event has occurred as well as the scope of the event. The BMA **510** then sends a broadcast short message request **512** to the SMSC **514** to send a short message to all mobile stations **516** in the region – *e.g.*, "20 cents/minute for long distance

to North Carolina due to Hurricane Isabel." The ULA **506** sends a message **518** to the prepaid platform **520** that toll calls are now to be billed at the new higher rate. The ULA **506** also sends a message **522** to the MSC **524**, which informs the MSC **524** that billing records need to indicate the different billing rate. The SMSC **514** sends a broadcast short message **526** to the MSC **524**. The message **526** could be sent to multiple MSCs, PBXs, landline switching offices or call session control functions (CSCF), depending upon the type of network(s) involved. The MSC **524** broadcasts a message **528** to the mobile stations **516** in each cell **530** through the appropriate transceiver stations **532**.

[0062] Alternatively, the load-based billing method of the present invention could be implemented in multimedia wireless networks, such as the new third generation wireless systems (3G), which are being developed through the 3rd Generation Partnership Project (3GPP), such as UMTS (Universal Mobile Telecommunications System). 3GPP is the new worldwide standard for the creation, delivery, and playback of multimedia over new, high-speed wireless networks. 3GPP enables the free sharing of multimedia files between a variety of devices, including wireless phones, PDAs (Personal Digital Assistants), and desktop computers. 3G devices generally include, in addition to a voice communication interface, capability for communication of data and display of data, including video.

[0063] FIG. **8** is a simplified block diagram of a typical multimedia wireless network **600** in which the present invention may also be implemented. The multimedia communication network **600** provides users with a variety of options for communication and is generally known in the

art. The network **600** provides access to data networks, such as the Internet, and public telephone networks, including wireless networks. With this network, users are able to transmit and receive multimedia communications, including audio, voice, video, and all types of data.

[0064] At least one communication device **612** is shown as being in communication with the network **600**. The communication device **612** generally includes an audio interface, such as a microphone and speakers, a visual interface, such as a display, and a user input interface, such as a keyboard or touch pad. The communication device **612** communicates with a switching center, such as a call session control function (CSCF) **614**, which directs multimedia communications between the communication devices **612** and various communication channels in the network **600**.

[0065] A home subscriber servicer (HSS) **616** is coupled to the CSCF **614** via a data link. The HSS **34** typically includes subscriber profile information, including information traditionally associated with a home location register (HLR) for a mobile subscriber. Suitably, the HSS **34** stores information such as user identification, user security information, including network access control information for authentication and authorization, user location information for user registration and locating, and user profiles, including identification of the services subscribed to and other service specific information.

[0066] The network **600** also includes any number of application servers (AS) **618** in networked communication with the CSCF **614**. A myriad of services and applications may reside in or be coupled to the application servers **36**, including multimedia messaging and voicemail

services. Thus, the AS **618** perform the SMSC function in this network example.

[0067] The network **600** further includes a billing platform **620** that receives call detail records from the CSCF **614**. The CDR may contain a record of a special Usage Level Event that applies at the time the CDR is written by the CSCF **614**.

[0068] The elements of the network **600** described thus far are standard in the industry, and their operation is known in the art. This embodiment of the present invention comprises an improvement to the communication network **600** of the type shown in FIG. **8**. The improvement includes adding a ULA **622** to analyze load usage in the network **600** as well as a BMA **24** for storing predetermined messages relating to various Usage Level Events.

[0069] The CSCF **614**, the HSS **616**, the application servers **618**, are all processor-based devices with data link interfaces for coupling together as described above and shown in FIG. **8**. These devices include one or more processors that execute programs to implement the functionality described herein and generally associated with 3G wireless systems. The flexibility of these processor-based systems permits ready integration into these systems of a load-based billing method and apparatus in accordance with the present invention.

[0070] In operation, the load-based billing method of the present invention would function substantially the same in the multimedia communication network **600** as it does in the conventional wireless network.

[0071] The above description merely provides a disclosure of particular embodiments of the invention and is not intended for the purposes of limiting the same thereto. As such, the invention is not limited to only the above-described embodiments. Rather, it is recognized that one skilled in the art could conceive alternative embodiments that fall within the scope of the invention.